# MySQL Cluster

This MySQL Cluster training teaches you how to install and configure a real-time database cluster at the core of your application. Expert instructors will teach you how to design and maintain your clusters for high availability and scalability by using MySQL Cluster's open-source and enterprise components.

**Learn To:**

- Install and configure MySQL Cluster nodes.
- Design simple and advanced cluster topologies.
- Secure cluster nodes and data.
- Backup and restore cluster data.
- Troubleshoot common cluster problems.
- Monitor and optimize cluster performance.
- Use enterprise tools to manage large cluster deployments.

**Benefits to You**

After taking this course, you will be able to evaluate MySQL Cluster in your application, and design a secure cluster topology to provide scalability and high availability. You will have developed the knowledge and skills to monitor and optimize the performance of your existing clusters and troubleshoot any problems that arise. You'll also be able to replicate between clusters that are separated by function or geography.

**Participate in Hands-on, Interactive Labs**

In addition to benefiting from interactive instruction, you'll also get a chance to create and configure several different clusters through hands-on exercises. You'll start by creating simple clusters manually, or with the MySQL Cluster Auto Installer. You will then create multiple clusters that are separated by a firewall, as well as clusters that use replication. These hands-on exercises will help you troubleshoot common problems and examine and optimize the performance of the cluster.

# Prerequisites

**Suggested Prerequisite**

- MySQL for Beginners Ed 3
- MySQL for Database Administrators Ed 3
- Oracle Linux 5 & 6 System Administration Ed 2
- Linux administration skills
- MySQL server configuration and usage
- Familiarity with VirtualBox

**Required Prerequisite**

- Must have a working knowledge of database concepts
- Must have a working knowledge of UNIX/Linux command-prompt usage
- Must have a basic knowledge of computer networking

# Audience

- Administrator
- Architect
- Database Administrator
- Developer
- Implementer
- Systems Administrator

# Objectives

- Identify and correct common cluster problems
- Describe common cluster use cases
- Configure replication between MySQL Clusters
- Describe MySQL Cluster operation in virtualized and Cloud environments
- Explain the concepts associated with MySQL Cluster
- Describe the MySQL Cluster architecture
- List features of the NDB Storage engine
- Describe MySQL Cluster design considerations
- Install MySQL Cluster
- Configure a basic MySQL Cluster
- Perform backup and recovery operations
- Secure a MySQL Cluster
- Maintain a MySQL Cluster by using the Management console and MySQL Cluster Manager
- Monitor and improve performance on a MySQL Cluster

# Topics

- Introduction to MySQL Cluster
  - MySQL Overview, Products, Services
  - Websites and Other Documentation
  - Key Benefits and Use Cases
  - Node types
- Installing MySQL Cluster
  - Hardware, Software, and Network Requirements
  - Choosing and Installing Cluster Distributions
  - Installing and Configuring Cluster Nodes
  - MySQL Cluster Auto-Installer
  - Starting a Cluster with a Basic Configuration
  - Upgrading a Cluster

- MySQL Cluster Architecture
  - The NDB storage engine
  - Clustered tables
  - SQL and NoSQL API nodes
  - Data Nodes and Node Groups
  - Partitions and Replicas
  - Checkpoints and the Redo Log
  - Redundancy and Resilience
- Configuring MySQL Cluster
  - MySQL Cluster Configuration Files
  - Basic Configuration Options: NodeId and HostName
  - Management Node Configuration
  - Data Node Configuration
  - Configuring Multi-Threaded Data Nodes
  - Cluster Program Startup Options
  - Viewing Cluster Configuration Information
- Designing a MySQL Cluster
  - Design Guidelines
  - Sizing Memory Usage
  - In-Memory and Disk Data Storage
  - Configuring Disk Data Storage
  - Designing Clusters for Scale and High Availability
  - Cluster Configuration Examples
- Maintaining a MySQL Cluster
  - Modifying Table Structure
  - Accessing the Cluster with Command-Line Tools
  - Single-User Mode
  - Backing Up a Cluster
  - Restoring a Cluster from Backup
- Securing MySQL Cluster
  - Securing MySQL Cluster
  - Configuring Connection Security
  - Configuring Firewall Rules
  - Data Security
  - MySQL Server Node Security
- MySQL Cluster Manager
  - Installing MySQL Cluster Manager Agent and Clients
  - Sites, Clusters, Hosts, Processes, Packages, and Configuration Attributes
  - Creating Managed Clusters
  - Importing a Configuration from an Unmanaged Cluster
  - Viewing Information About Your Sites and Clusters
  - Maintaining Your Sites and Clusters
- Replicating Between MySQL Clusters
  - Replication in MySQL Cluster
  - Transaction Ordering and Epochs
  - Configuring Replication
  - Starting, Stopping, and Resetting Replication
  - Backups Using Replication Tables
  - Replication Resilience
  - Replication Information Repositories
  - Multi-Master Replication and Conflict Resolution
- Monitoring MySQL Cluster
  - Introduction to Monitoring
  - Monitoring with the ndb_mgm Client

- - Using the Cluster Log
    - ndbinfo Database
    - Status Variables
    - MySQL Enterprise Monitor
- Troubleshooting MySQL Cluster Problems
    - Starting to Troubleshoot
    - Heartbeats
    - Configuration Problems
    - Disk Activity Problems
    - Application Design Problems
- Optimizing MySQL Cluster Performance
    - Performance Concepts
    - Identifying Queries for Optimization
    - Optimizing with Indexes
    - Using EXPLAIN
    - Adaptive Query Localization
    - Distribution Awareness
    - The Process of Optimizing and Benchmarking
- MySQL Cluster Environments
    - MySQL Cluster and Virtualization
    - Node Deployment in Cloud Environments
    - Connecting to a Cluster with SQL and NoSQL APIs
    - Comparing MySQL Cluster with Other High-Availability Solutions
- Conclusion
    - Summary course contents and objectives
    - Recap of MySQL Products, services, websites, training, documentation